

Abstract Of The Disclosure

A method and apparatus enabling increased sensitivity in ion mobility spectrometry/mass spectrometry instruments which substantially reduces or eliminates the loss of ions in ion mobility spectrometer drift tubes utilizing an hourglass electrodynamic ion funnel at the entrance to the drift tube and/or an internal ion funnel at the exit of the drift tube. An hourglass electrodynamic funnel is formed of at least an entry element, a center element, and an exit element, wherein the aperture of the center element is smaller than the aperture of the entry element and the aperture of the exit elements. Ions generated in a relatively high pressure region by an ion source at the exterior of the hourglass electrodynamic funnel are transmitted to a relatively low pressure region at the entrance of the hourglass funnel through a conductance limiting orifice. Alternating and direct electrical potentials are applied to the elements of the hourglass electrodynamic funnel thereby drawing ions into and through the hourglass electrodynamic funnel thereby introducing relatively large quantities of ions into the drift tube while maintaining the gas pressure and composition at the interior of the drift tube as distinct from those at the entrance of the electrodynamic funnel and allowing a positive gas pressure to be maintained within the drift tube, if desired. An internal ion funnel is provided within the drift tube and is positioned at the exit of said drift tube. The advantage of the internal ion funnel is that ions that are dispersed away from the exit aperture within the drift tube, such as those that are typically lost in conventional drift tubes to any subsequent analysis or measurement, are instead directed through the exit of the drift tube, vastly increasing the amount of ions exiting the drift tube.